

## Assessment scales for delirium: A review

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### Abstract

Over the years many scales have been designed for screening, diagnosis and assessing the severity of delirium. In this paper we review the various instruments available to screen the patients for delirium, instruments available to diagnose delirium, assess the severity, cognitive functions, motoric subtypes, etiology and associated distress. Among the various screening instruments, NEECHAM confusion scale and delirium observation scale appear to be most suitable screening instrument for patients' in general medical and surgical wards, depending on the type of rater (physician or nurse). In general, the instruments which are used for diagnosis [i.e., confusion assessment method (CAM), CAM for intensive care unit (CAM-ICU), Delirium Rating Scale-revised version (DRS-R-98), memorial delirium assessment scale, *etc.*] are based on various Diagnostic and Statistical Manual criteria and have good to excellent reliability and fair to good validity. Among the various diagnostic instruments, CAM is considered to be most useful instrument because of its accuracy, brevity, and ease of use by clinicians and lay interviewers. In contrast, DRS-R-98 appears to be a comprehensive instrument useful for diagnosis, severity rating and is sensitive to change and hence can be used for monitor-

ing patients over a period. In the ICU setting, evidence suggests that CAM-ICU and Nursing Delirium Screening Scale had comparable sensitivities, but CAM-ICU has higher specificity. With regard to assessment of delirium in pediatric age group, certain instruments like Pediatric Anesthesia Emergence Delirium scale and pediatric CAM-ICU has been designed and have been found to be useful.

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**Key words:** Delirium; Screening; Diagnosis; Cognition

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### INTRODUCTION

Delirium is an acute onset potentially reversible organic brain syndrome. It is considered as an altered mental state, which is somewhere on the continuum between coma and stupor at one extreme and normal wakefulness and alertness at the other<sup>[1]</sup>. Delirium is highly prevalent across different treatment settings and is generally reported to be more frequent in elderly, in those with pre-existing cognitive impairment and in those admitted to the intensive care unit (ICU). It is independently associated with significant increases in the length of hospital stay, inpatient mortality, long term mortality, cognitive decline, requirement for institutional care, functional impairment, healthcare costs, distress to the patient and family distress<sup>[2-5]</sup>. In view of the above, it is very important to identify and manage delirium to reduce morbidity and mortality in medically ill subjects.

Prior to third revision of Diagnostic and Statistical

Manual (DSM-III)<sup>[6]</sup> there were no standardized diagnostic criteria for delirium. Hence, before 1980, multiple terms (acute brain failure, acute confusional state, acute organic syndrome, postoperative psychosis, toxic psychosis, ICU psychosis, cerebral insufficiency, encephalopathy, *etc.*) were used in the literature to describe delirium. Over the years, there has been a considerable improvement in understanding this disorder, but differences in terminology still persist. Over the last 3 decades, with the improvement in understanding, the criteria for delirium have been revised in the subsequent versions of the DSM (III-R and IV)<sup>[7,8]</sup>, but the core features have remained the same.

For a better understanding and communication between the clinicians and researchers, it is important to record the behaviours of the patients in systematic way. This can be achieved by using standardised rating scales. In routine clinical practice, the standardised instruments can help in detection of certain symptoms, in rating the clinical improvement and evaluating the effectiveness of various interventions. In research, use of standardised instrument can be useful in comparing the results of various studies and evaluating the efficacy of various therapeutic interventions. Further, standardized instruments can aid in teaching the trainee how to evaluate and monitor the clinical picture more comprehensively.

Over the years, various instruments have been designed to assess various aspects of delirium. In this review, we shall evaluate the available instruments for assessment of delirium in clinical and research setting. For this review, a PubMed search was carried out using the key words delirium, assessment, prevalence, incidence, instruments, screening, etiology, risk factors and motor symptoms in various combinations. The results were screened for all the currently available instruments. In total 38 instruments were chosen for this review. Rather than being restrictive, we have tried to include all the instruments that cover the various facets of delirium.

The available instruments can be broadly divided into those which are used to assess as to whether the patient is arousable and in a state to be assessed for delirium [e.g., Richmond Agitation and Sedation Scale (RASS)<sup>[9]</sup>], scales to evaluate the patients for pre-existing dementia so as to identify cases of delirium superimposed on dementia [e.g., retrospective Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE)<sup>[10]</sup>], instruments used for screening for delirium, instruments useful for grading the severity of delirium and rating the phenomenology, instruments useful for assessment of cognitive functions, motors symptoms, associated risk factors, etiologies, severity of medical-surgical morbidity and distress associated with delirium. The list of various instruments is given in Table 1<sup>[9-47]</sup>.

## INSTRUMENTS FOR ASSESSMENT OF AROUSABILITY OF THE PATIENT

As delirium on the continuum between coma and stupor at one extreme and normal wakefulness and alertness at

the other extreme, it is important to evaluate whether the patient is arousable for assessment for delirium. In intensive care setting, many times patients may be comatose or stuporous and it is difficult to assess the patient for delirium. Richmond Agitation and Sedation Scale has been specially designed to assess the level of sedation and agitation in adult patients admitted to ICU.

### **Richmond agitation and sedation scale**

The RASS was developed by at Virginia Commonwealth University in Richmond, Virginia. It is used to assess sedation and agitation of adult patients admitted in ICUs. It is a 10- point scale with 4 levels of anxiety or agitation (+1 to +4), one level to denote a calm and alert state (0) and 5 levels to assess the level of sedation (-1 to -5). A score of +4 indicates that patient overtly combative or violent and is immediate danger to staff. A score of -4 indicates that the patient is unresponsive to verbal stimulation and finally, culminating in unarousable states (-5). A score of +1 to +4 denotes increasing level of agitation and a score of -1 to -5 denotes increasing level of sedation. It is easy to administer and can be used by physicians and nurses. It has been shown to have high inter-rater reliability and validity in medical and surgical, ventilated and nonventilated, and sedated and non-sedated adult ICU patients<sup>[9]</sup>. Usually a patient who scores between +4 to -4 is considered to be assessable for delirium. Some researchers have also used RASS for sub-typing of delirium. Hyperactive delirium is defined as persistent rating of +1 to +4 during all assessments. Hypoactive delirium is defined as persistent rating of 0 to -3 during all assessments and mixed subtype is defined as present when the patients has rating of both hyperactive and hypoactive RASS values<sup>[48]</sup>. This scale has been used frequently in research setting and also in the clinical practice to monitor the patients with delirium.

## INSTRUMENTS FOR SCREENING FOR PREMORBID COGNITIVE DISTURBANCES

As delirium is quite prevalent in elderly and there is significant overlap between the symptoms of delirium and dementia, a scale, i.e., retrospective IQCODE<sup>[10,11]</sup> has been designed to assess the cognitive level of patients from the information provided by the caregivers.

### **Informant questionnaire on cognitive decline in the elderly**

It is a screening questionnaire to assess cognitive decline in elderly and is to screen for dementia. It can be completed by the relatives or other caregivers of the elderly persons. Although it was developed for informant self-completion, it has also been used as a face-to-face interview and as a telephone interview<sup>[10,11]</sup>. Because the IQCODE does not require the involvement of the person being assessed, it can be used to assess probable dementia in someone who is unable to participate herself/himself such as a patient with delirium. The original version of the IQCODE has description of 26 everyday situations

**Table 1 Scales for assessment of delirium in clinical and research setting**

Instruments for assessment of arousability of the patient	RASS <sup>[9]</sup>
Instruments for screening for premorbid cognitive disturbances	IQCODE <sup>[10,11]</sup>
Screening instruments	NEECHAM Confusion Scale <sup>[12]</sup>
	Nursing Delirium Screening Scale <sup>[13]</sup>
	Delirium Observation Screening Scale/Delirium Observation Scale <sup>[14,15]</sup>
	Intensive care delirium screening checklist <sup>[16]</sup>
	Pediatric Anesthesia Emergence Delirium scale <sup>[17]</sup>
Diagnostic instruments	Global Attentiveness Rating <sup>[18]</sup>
	Delirium Symptom Interview <sup>[19]</sup>
	Saskatoon Delirium Checklist <sup>[20]</sup>
	Delirium Rating Scale-revised version <sup>[21]</sup>
	Memorial Delirium Assessment Scale <sup>[22]</sup>
	Confusion Assessment Method <sup>[23]</sup>
	CAM-ICU <sup>[24,25]</sup>
	Paediatrics CAM-ICU <sup>[26]</sup>
	Clinical Assessment of Confusion - A and B <sup>[27,28]</sup>
Instruments for Assessment of severity of delirium	Delirium Rating Scale <sup>[29]</sup>
	Delirium Rating Scale-Revised-98 <sup>[21]</sup>
	Confusion Assessment Method <sup>[23]</sup>
	Confusion Assessment Method for Intensive Care Unit assessment tool <sup>[24,25]</sup>
	Delirium-O-Meter <sup>[30]</sup>
	Delirium Index <sup>[31]</sup>
	Memorial Delirium Assessment Scale <sup>[22]</sup>
	Confusional State Evaluation Scale <sup>[32]</sup>
	Delirium Assessment Scale <sup>[33]</sup>
	Delirium Severity Scale <sup>[34]</sup>
Instruments for assessment of cognitive symptoms only	Mini Mental Status Examination <sup>[35]</sup>
	Cognitive Test for Delirium <sup>[36,37]</sup>
	Clock Drawing test <sup>[38]</sup>
	Digit Span Test <sup>[39,40]</sup>
	Vigilance "A" Test <sup>[40]</sup>
	Mental state Questionnaire <sup>[41,42]</sup>
	Short Portable Mental Status Questionnaire <sup>[43]</sup>
Motor symptoms	Delirium Motor Checklist, Delirium Motor Symptom Scale <sup>[44,45]</sup>
	Richmond Agitation and Sedation Scale <sup>[9]</sup>
	Motoric items of Delirium Rating Scale, Delirium Rating Scale-Revised-98, Memorial Delirium Assessment Scale <sup>[21,22,29]</sup>
Etiology, risk factors	Delirium Etiology Checklist <sup>[46]</sup>
Paediatric delirium	Pediatric Anesthesia Emergence Delirium scale <sup>[17]</sup>
Distress with delirium experience	Delirium Experience Questionnaire <sup>[47]</sup>

CAM-ICU: Confusion Assessment Method for Intensive Care Unit assessment tool.

where a person has to use memory and intelligence. Each situation is rated based on the amount of change over the previous 10 years. However, over the years, besides the use of 10 years time frame, many researchers have used 5 years<sup>[49]</sup> or a flexible time frame<sup>[50]</sup>. Each item is rated on a 5 point rating scale, 1 rated as much improved, 2 rated as a bit improved, 3 rated as not much change, 4 indicates a bit worse and 5 indicates much worse functioning. A person who has no cognitive decline will have an average score of 3, while scores of greater than 3 indicate that some decline has occurred. However, some users of the IQCODE score it by summing the scores to give a range from 26 to 130. Various cutoff scores have been used to distinguish dementia from normality. In community samples, mean item cutoff scores of 3.3 and above to 3.6 and above is taken as likely indicator of dementia, while in patient samples the cutoff scores 3.4 and above to 4.0 and above are taken as indicators of dementia. Studies have shown good correlation between IQCODE score and the Mini-Mental State Examination,

and a moderate level of correlation of IQCODE with various neuropsychological tests<sup>[11]</sup>. The IQCODE scores have no relationship with a person's level of education or with their premorbid level intelligence. This is in contrast to MMSE, which is affected by education and intelligence as well as the presence of dementia<sup>[11]</sup>. Coefficient  $\alpha$  of IQCODE is high (0.93-0.97) and the test-retest reliability is 0.96 over 3 d and 0.75 over 1 year<sup>[11]</sup>. A shorter version with 16 items (Short IQCODE) has been designed and has been shown to have good correlation (0.98) with the full version and comparable validity<sup>[11]</sup>. The shorter IQCODE version has been used in elderly patients to evaluate the previous level of cognitive functioning, to distinguish delirium from dementia and to identify cases of delirium superimposed on dementia<sup>[51]</sup>.

## SCREENING INSTRUMENTS

As delirium occurs in medical surgical setting and it is not possible to screen all patients for delirium by mental health

**Table 2** Important features of rating scales useful for screening, diagnosis and severity rating of Delirium

Scale	Criteria on which the scale was based	No. of items	Ratings done by	Time taken in minutes	Screening	Diagnosis	Severity rating
Clinical Assessment Confusion-A <sup>[27,28]</sup>		25	Nurses	< 5		√	
Clinical Assessment Confusion-B <sup>[27,28]</sup>		58	Nurses			√	
Confusion Assessment Method <sup>[23]</sup>	DSM-III-R	9	Non psychiatrist clinicians	< 5	√	√	√
Confusion State Evaluation <sup>[32]</sup>	Research	22	Nurses, physicians, psychologists	< 30		√	√
Cognitive Test for Delirium <sup>[36,37]</sup>	DSM-III-R	9	Research assistant	10-15			
Delirium Assessment Scale <sup>[33]</sup>	DSM-III	8	Physicians				√
Delirium Index <sup>[31]</sup>	DSM-III-R	7	Research assistant	5-10			√
Delirium Observation Screening Scale <sup>[14,15]</sup>	DSM-IV	25	Research assistant	5-10	√		
Delirium Observation Scale <sup>[14,15]</sup>	DSM-IV	13	Nurses	< 5	√		
Delirium Rating Scale <sup>[29]</sup>	DSM-III	10	Trained clinicians				√
Delirium Symptom Interview <sup>[19]</sup>	DSM-III	109	Trained interviewer	15		√	√
Delirium Severity Scale <sup>[34]</sup>			Research assistant	10			√
Memorial Delirium Assessment Scale <sup>[22]</sup>	DSM-IV	10	Physicians	10-15			√
NEECHAM Confusion Scale <sup>[12]</sup>	Research	9	Nurses	10	√		
Delirium Rating Scale-Revised-98 <sup>[21]</sup>	DSM-IV	16	Psychiatrists				
Nursing Delirium Screening Scale <sup>[13]</sup>		5	Nurses	1	√	√	
Intensive care delirium screening checklist <sup>[16]</sup>	DSM-IV	8	Non-specialist staff	7-10			
Pediatric Anesthesia Emergence Delirium scale <sup>[17]</sup>		5					
Saskatoon Delirium Checklist <sup>[20]</sup>	DSM-III	10	Clinician	< 15		√	
Delirium-O-Meter <sup>[30]</sup>	DSM-IV	12	Limited training				√
Confusion assessment method for intensive care unit assessment tool <sup>[24,25]</sup>	DSM-IV	9	Trained health professional	< 5		√	

DSM: Diagnostic and Statistical Manual.

professional, many screening instruments have been designed to be used by non-mental health professional for evaluating the patients for possible delirium. Some of these instruments have been designed to be used in specific treatment setting like, ICU, whereas others focus on specific age group, like children and adolescents. The available instruments include: NEECHAM Confusion Scale<sup>[12]</sup>, DOSS/DOS<sup>[14,15]</sup>, Nu-DESC<sup>[13]</sup>, ICDSC<sup>[16]</sup> and PAED scale<sup>[17]</sup>. A comparison various characteristics of various instruments are shown in Tables 2 and 3. The instruments which specifically focus on the cognitive functions only and have also been used for screening patients for delirium are described in the subsequent section.

### NEECHAM confusion scale

It is a screening scale which can be used by nurses to rate the patient's behaviour while providing routine care to patients. The scale has 3 subscales. Subscale -1 has 3 items and measures cognitive processing (attention, ability to follow command, and orientation) and the rating varies from 0-14 for the subscale, subscale-2 has 3 items and measures behaviour (appearance and motor and verbal behaviour) and the rating varies from 0-10 for this subscale, and the subscale-3 also has 3 items to rate physiological parameters [stability of vital functions (temperature, blood pressure, heart rate and respiration), oxygen saturation stability and urinary continence control]. The total score ranges from 0 (minimal responsiveness) to 30 (normal function). A score below 20 points indicates moderate to severe delirium, a score between 20 and 24 suggests mild

or early development of delirium. A score of 25 and 26 suggests that the patient is "not delirious", but the patients are at high risk for delirium and a score of 27-30 indicates normal function. The scale takes 10 min to complete. It has high inter-rater reliability ( $r = .96$ ), good validity, high sensitivity (95%) and specificity (78%). It has good correlation with MMSE<sup>[12]</sup>. This scale was initially designed to evaluate delirium in patients with hip fracture, but subsequently has been used in other clinical settings like nursing homes<sup>[52]</sup>, medical wards<sup>[12]</sup> and ICUs<sup>[53]</sup>.

### Nursing delirium screening scale

It is a 5 item screening scale which assesses disorientation, inappropriate behavior, inappropriate communication, hallucination, and psychomotor retardation. It is designed to be administered by a nurse based on clinical observation in routine practice. Each item is rated on a 3 point scale (0-2) and the total score varies from 0-10. The cutoff for delirium is reported to be 2. It takes 1 min to complete the instrument. Nu-DESC has been shown to have a sensitivity of 85.7% and specificity of 86.8% for the diagnosis of delirium<sup>[13]</sup>.

### Delirium observation screening scale

DOSS is based on DSM-IV criteria of delirium and consists of a 25-items scale. It was designed to be used by nurses during the routine patient care to pick up early symptoms of delirium<sup>[14]</sup>. The scale was subsequently reduced to 13 items, and is known as DOS. The 13 items are scored dichotomously as "present" or "absent" (total

**Table 3 Symptom coverage by various scales vis a vis Diagnostic and Statistical Manual-III, III R, IV and International Classification of Diseases, Tenth Revision criteria**

Diagnostic criteria/ rating scale	Acute onset	Fluctuating course	Presence of Physical Disorder	Disturbance in level of Consciousness	Disturbance in Attention	Disturbance in orientation	Disturbance in Thinking	Memory disturbances	Perceptual abnormality	Disturbance in psychomotor activity	Alteration in sleep wake cycle	Mood features	Others
DSM-III <sup>[6]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
DSM-III-R <sup>[7]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
DSM-IV <sup>[8]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
ICD-10 <sup>[54]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CAC-A <sup>[27,28]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓ <sup>6</sup>
CAC-B <sup>[27,28]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓ <sup>6</sup>
CAM <sup>[23]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓ <sup>1</sup>
CSE <sup>[52]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CTD <sup>[36,37]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
DAS <sup>[33]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Delirium-O-meter <sup>[30]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
DJ <sup>[31]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
DOSS <sup>[14,15]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
DRS <sup>[20]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓ <sup>7</sup>
DRS-R-98 <sup>[21]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓ <sup>2</sup>
DSI <sup>[19]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
DSS <sup>[34]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
ICDSC <sup>[16]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
MDAS <sup>[22]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
NEECHAM <sup>[12]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Nu-DESC <sup>[13]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓ <sup>5</sup>
Saskatoon DC <sup>[20]</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓ <sup>2</sup>

<sup>1</sup>Includes perseveration, impaired contact, irritability, mental uneasiness, intensity of the current episode, frequency and intensity of the episodes; <sup>2</sup>Inappropriate thinking or mood; <sup>3</sup>Incoherence of speech; <sup>4</sup>Includes apathy and anxiety; <sup>5</sup>Inappropriate behaviour, inappropriate communication; <sup>6</sup>General behaviour; <sup>7</sup>Is picking, disorderly, restless; <sup>8</sup>Pulls IV tubing, feeding tubes, catheters, etc; DSM: Diagnostic and Statistical Manual; ICD-10: International Classification of Diseases, Tenth Revision; DRS-R-98: Delirium Rating Scale-revised version; CTD: Cognitive Test for Delirium.

score 0-13). It can be rated per shift by the nursing staff and the ratings of all the 3 shifted can be added and the score per day can range from 0-39. However the final score is calculated by taking the mean of the 3 shifts and it ranges from 0-13. A score greater than 3 indicates delirium<sup>[15]</sup>. DOSS has been shown to have high internal consistency ( $\alpha = 0.96$ ) and high content validity ( $\alpha = 0.93$ ). Predictive validity against the DSM-IV<sup>[8]</sup> diagnosis of delirium has been shown to be good. It has good correlations with MMSE<sup>[35]</sup>. It has good concurrent validity with confusion assessment method (CAM)<sup>[23]</sup> and has good construct validity (tested against the IQCODE)<sup>[11]</sup>.

**Intensive care delirium screening checklist**

It is a screening instrument based on DSM-IV criteria of delirium. It can be administered in 7 to 10 min by the non-specialist staff of the ICU. It consists of 8 items with a score of 0 or 1 for each item; each item is rated on the basis of patient's behaviour in the previous 24 h. A cutoff of 4 is used for further assessment for delirium. Its sensitivity (99%), specificity (64%), and interrater reliability when used by intensive care staff have been reported to be adequate<sup>[10]</sup>.

**Pediatric anesthesia emergence delirium scale**

PAED scale was designed to measure the anesthesia emergence delirium in children. It consists of 5 statements [(1) The child makes eye contact with the caregiver; (2) the child'

s actions are purposeful; (3) the child is aware of his/her surroundings; (4) the child is restless; and (5) the child is inconsolable] rated from 1 to 4 with reverse scoring where ever applicable. The internal consistency of the PAED scale has been found to be 0.89, and the reliability is 0.84. The scale has been found to have a sensitivity of 0.64<sup>[17]</sup>.

### **Global attentiveness rating**

The global attentiveness rating is based on a minimum of 2 min of general conversation of physician with the patient, without necessarily any formal cognitive testing or corroborative information. After this conversation, the physician is asked to answer the question - "How well did the patient keep his mind on interacting with you during the interview?" The answer is rated on an uninterrupted 10-cm visual analog scale<sup>[18]</sup>.

## **DIAGNOSTIC INSTRUMENTS**

Over the years various diagnostic instruments have been developed based on the DSM criteria of delirium for making the diagnosis of delirium. Most of these instruments are also useful in studying the phenomenology of delirium. These instruments are Delirium Symptom Interview, Saskatoon Delirium Checklist, Delirium Rating Scale-revised version (DRS-R-98), MDAS, CAM, CAM-ICU, Paediatrics CAM and CAC-A and B. A comparison various characteristics of various instruments are shown in Tables 2 and 3.

## **DELIRIUM SYMPTOM INTERVIEW**

It was developed as a diagnostic interview for detection and diagnosis of delirium based on the DSM-III definition of delirium. It covers both the cognitive and non-cognitive aspects of delirium. It takes 15 min to complete the interview. This interview had good validity and reliability. The sensitivity of the DSI was 0.90 and the specificity was 0.80, when compared with the clinical judgment of a psychiatrist and neurologist. Interrater reliability, using lay interviewers, was 0.90 for the detection of major symptoms of delirium<sup>[19]</sup>. However, this instrument has not been used quite frequently in research and very little information is available about delirium based on DSI.

### **Saskatoon delirium checklist**

It is a diagnostic checklist developed based on the DSM-III criteria of delirium. It has 10 items rated on a 5 point scale (0-4) with lower scores indicating higher severity of delirium. First 9 items of the checklist covers various symptoms of delirium and the later items assess the level of association with the physical cause. It can also be used to study the phenomenology of delirium<sup>[20]</sup>. However, this scale has been used by very few researchers.

### **DRS-R-98**

DRS-R-98 is an instrument which has provision for assessment of broad range of symptoms of delirium. It is

to be used by an experienced expert. It has 16- item, 13 of which assess the severity of symptoms and 3 items are of diagnostic significance. The rating is applicable to the preceding 24 h. Each severity item's rating levels are anchored with descriptions appropriate to that particular symptom. The severity ratings range from 0 (no impairment) to 3 (severe impairment) and a severity score > 15 or a total score of > 18 is indicative of delirium; higher scores indicate higher severity of delirium. The severity scale is particularly useful when phenomenology is being studied or for repeated measures within an episode of delirium when the diagnosis is already established. The severity items can further be classified as cognitive and noncognitive delirium symptoms. During the validation of the scale, ratings were done in patients from a variety of medical, surgical, critical care, psychiatric, nursing home unit and rehabilitation inpatient settings while blinded to psychiatric diagnosis. The DRS-R-98 total score distinguishes delirium from dementia, schizophrenia, depression, and other medical illnesses during blind rating, with sensitivity ranging from 91% to 100%, depending on the cut-off score chosen<sup>[21]</sup>. The original English version has high sensitivity and specificity, inter-rater reliability, and concurrent validity to the DRS<sup>[29]</sup> and Cognitive Test for Delirium (CTD)<sup>[36]</sup>. DRS-R-98 correlates highly with DRS (Original Version, 1988)<sup>[29]</sup> ( $r = 0.83$ ), the CTD<sup>[36]</sup> ( $r = -0.62$ ) and the Clinical Global Impression Scale. Inter-rater reliability (intraclass correlation coefficient = 0.99) and internal consistency (Cronbach  $\alpha$ -0.90) are also reported to be high. The DRS-R-98 has also been used to evaluate pediatric delirium<sup>[55]</sup>. It is a very popular instrument for studying the severity and phenomenology of delirium in research in recent times.

### **Memorial delirium assessment scale**

Is a physician rated instrument designed to measure the severity of delirium. It has 10 items which assesses disturbances in arousal and level of consciousness, as well as several areas of cognitive functioning (memory, attention, orientation and disturbances in thinking) and psychomotor activity. The items are rated on a four point scale (0-3) based on the current interaction with the patient or by assessment of his/her behaviour or experience over past several hours and its completion requires about 10-15 min.

It was designed with the intent that the instrument could be administered repeatedly within the same day, to allow for objective measurement of changes in delirium severity in response to medical changes or clinical interventions. It has been shown to have high inter-rater reliability (0.92), internal consistency (coefficient  $\alpha = 0.91$ ). MDAS has also shown to have high correlation with ratings on the DRS (Spearman rank Correlation = 0.88,  $P < 0.0001$ ), the MMSE (Spearman rank Correlation = 0.91,  $P < 0.0001$ ), and clinician's global ratings of delirium severity (Spearman rank Correlation = 0.89,  $P < 0.0001$ ). MDAS total scores differ significantly between patients with delirium and those with other cognitive impairment

disorders or no cognitive impairment. It is also used for making diagnosis of delirium and a cutoff score of 13 has been shown to be useful for making the diagnosis of delirium<sup>[22]</sup>.

### **Confusion assessment method**

CAM is a diagnostic instrument for identification of delirium. The instrument assesses the presence, severity, and fluctuation of 9 delirium features: acute onset, inattention, disorganized thinking, altered level of consciousness, disorientation, memory impairment, perceptual disturbances, psychomotor agitation or retardation, and altered sleep-wake cycle. It can be administered in 5 min by non-psychiatrist physicians. The CAM diagnostic algorithm is based on the cardinal elements of the DSM-III R<sup>[7]</sup> criteria for delirium: features 1 (acute onset and fluctuating course) and 2 (inattention) are essential features, and feature 3 (disorganized thinking) or 4 (altered level of consciousness) is supported by expert judgment and clinical practice, in which the first 2 and either of the latter 2 are required for diagnosis<sup>[23]</sup>. The validity of CAM has been evaluated against the diagnosis made by geriatrician, psychiatrist, neuropsychologists, and advanced practice nurses; DSM-III<sup>[6]</sup>, DSM-III R<sup>[7]</sup>, DSM-IV<sup>[8]</sup>, or International Classification of Diseases, Tenth Revision (ICD-10)<sup>[54]</sup>, criteria or a consensus diagnosis. The sensitivity of CAM has varied from 46% to 100%, with lower sensitivities reported when the CAM was used by nurses or research assistants<sup>[56-60]</sup>. The specificity of CAM has varied from 63% to 100%, with overall, with lower specificity in presence of psychiatric comorbidity<sup>[61]</sup>. Based on the pooled data of 7 high quality studies, CAM has been shown to have high concurrent validity with psychiatrist's diagnosis with a sensitivity of 94%, specificity of 89% and high inter-rater reliability ( $\kappa$  0.7-1.0)<sup>[60]</sup>. Based on the pooled data of 7 high quality studies, CAM has been shown to have high concurrent validity with psychiatrist's diagnosis with a sensitivity of 94% and specificity of 89% and high inter-rater reliability ( $\kappa$  0.7-1.0)<sup>[59]</sup>. It correlates significantly with the Mini-Mental Status Examination<sup>[3]</sup>, DRS<sup>[2]</sup>, DSM-IV<sup>[8]</sup>, DSM-III R<sup>[7]</sup> and ICD-10<sup>[54]</sup> criteria for delirium<sup>[61]</sup>, the Visual Analog Scale for Confusion and the digit span test. CAM is not considered to be a very useful instrument to rate the severity of delirium and due to the same is not considered to be useful to rate clinical improvement or deterioration. The CAM should preferably be used by physicians or those who have received training for administering the same. CAM-ICU has been used frequently in the research setting. It is one of the very few instruments which have been translated in 10 languages<sup>[59]</sup>. It has been widely used in research.

### **Confusion assessment method for ICU assessment tool**

It was specifically developed for use in non-verbal (i.e. mechanically ventilated) patients. With the CAM-ICU, delirium is diagnosed when patients demonstrate: (1) an acute change in mental status or fluctuating changes in

mental status; (2) inattention measured using either an auditory or visual test; and either (3) disorganized thinking; or (4) an altered level of consciousness. Importantly, the CAM-ICU can be administered if the patient is arousable to voice without the need for physical stimulation. The CAM-ICU includes very specific assessment questions/tools. When administered by a trained health care professional, the CAM-ICU takes only 1 to 2 min. When compared with diagnosis of delirium made by experts based on DSM-IV criteria, CAM-ICU has a sensitivity of 95% to 100%, specificity of 93% to 98%, and interrater reliability of 0.79 to 0.95<sup>[24,25]</sup>. However, it is important to remember that when the non-verbal ratings and verbal ratings of CAM-ICU are compared the non-verbal ratings have a lower sensitivity (73%) and a lower interrater reliability (0.64) but high specificity (100%) is maintained<sup>[61]</sup>. Thus, it is suggested that whenever possible standard cognitive tests using verbal responses should be used to avoid missing delirium cases. CAM-ICU has been used in research setting.

### **Paediatrics CAM**

Recently, pCAM-ICU has been designed to evaluate delirium in pediatric ICU setting. Paediatric CAM is based on CAM and CAM-ICU, and various age appropriate adaptations were done to use the instrument in verbal and nonverbal children with the cognition expected of a developmentally appropriate 5-year-old child. The various adaptations include: modification of auditory letter sequence of attention screening examination, modification of pictures used for the visual ASC with elementary, bold-colored pictures, which were easily identified by children. Assessment of disorganized thinking therefore has been modified to include questions that were developmentally appropriate for 5 years old child. pCAM-ICU has been found to have adequate sensitivity (83%) and specificity of 99% and a high interrater reliability ( $\kappa$  value = 0.96)<sup>[26]</sup>.

### **Clinical assessment of confusion-A and B**

CAC-A is a 25 item instrument, which was designed for diagnosis of delirium by nurses. The presence of more behaviors is associated with more severe confusion. The 25 items are divided into 5 subscales, viz., cognition, general behavior, motor response, orientation and psychotic neurotic behaviour<sup>[26,27]</sup>. In acute care settings, CAC-A has been shown to have high internal consistency (0.80) and high interrater reliability (0.88). When compared with short portable mental status questionnaire and Visual Analogue scale of confusion, the concurrent validity has been found to be good (0.71 and 0.81, respectively). Concurrent validity with DSM-IV criteria and MMSE has also been reported to be good<sup>[62]</sup>. However, when evaluated against the DSM-IV criteria of delirium, it is seen that CAC-A covers only 9 of the possible 17 items of DSM-IV criteria and hence has been reported to have poor criterion validity. CAC-B consists of 58 items divided into 7 subscales: cognition, general behaviour, motor

activity/speech motor ability/sensory acuity, orientation, behaviours that threaten the safety of patient, psychotic neurotic behaviours and ability to interact/perform activities of daily living/speech content. CAC-B has been shown to have high internal consistency (0.95) and high interrater reliability (0.69-0.90)<sup>[63]</sup>. When evaluated against the DSM-IV criteria of delirium, it is seen that CAC-B covers only 13 of the possible 17 items of DSM-IV criteria and hence has been reported to have good criterion validity<sup>[63]</sup>.

## INSTRUMENTS FOR ASSESSMENT OF SEVERITY OF DELIRIUM

Although various instruments have been designed to diagnose delirium the diagnostic scores of some of these scales can't be used to rate the severity of delirium. On the other hand, there are certain scales which are useful for rating the severity of delirium, but are not useful for diagnosis of delirium. Hence, it is important to choose appropriate instrument for the specific purpose.

Various instruments used to rate the severity of delirium include DRS<sup>[29]</sup>, DRS-R-98<sup>[21]</sup>, MDAS<sup>[22]</sup>, DOM<sup>[30]</sup> and DI<sup>[31]</sup>. A comparison various characteristics of various instruments are shown in Tables 2 and 3.

### DRS

It is 10 items scale to be completed by a clinician with psychiatric training, based on the behaviour of the patient over a 24 h period. Each item rated from 0 to a maximum either of 2, 3, or 4 points, depending on the item. The sum of all item scores comprises the total DRS score with a maximum possible score is 32 points. It has been shown to have high validity, high interrater reliability, and substantial sensitivity and specificity<sup>[29]</sup>. However, DRS was criticised for it not been useful for repeated administration as a full scale and clubbing of all the cognitive disturbances on to one item. Hence, it required use of scales like MMSE<sup>[35]</sup> to get the complete picture of delirium. Similarly the motor symptoms are also loaded onto 1 item. Because of these limitations, the DRS was revised in 1998 to DRS-R-98<sup>[21]</sup>. Although the DRS has its limitations, it may be more useful while evaluating patients emerging from stupor because a number of DRS-R-98 items may not be assessable or when being used by less skilled clinicians. Similarly, DRS may be more useful than DRS-R-98 while evaluating delirium in pediatric age group, especially in preverbal children<sup>[55]</sup>. DRS has been widely used in research.

### Delirium-o-meter

It is a scale to rate the severity of delirium, which can be used by nurses with limited training<sup>[30]</sup>. The scale was designed to be compatible with DSM-IV criteria of delirium, to be able to capture both hyperactive and hypoactive symptoms, as well as and key aspects of other DRSs such as the DRS-R-98<sup>[21]</sup>, the CAM<sup>[23]</sup>, the NEECHAM confusion scale<sup>[12]</sup> and the DOS<sup>[14,15]</sup>. The scale

has 12-item behavioural observation scale consisting of the following categories: sustained attention, shifting of attention, orientation, consciousness disturbance, apathy, hypokinesia/psychomotor retardation, incoherence, fluctuating functioning (diurnal variation/sleep-wake cycle), restlessness (psychomotor agitation), delusions, hallucinations and anxiety/fear. Each item is rated on a four-point scale (0-absent; no pathology; 1-mild disturbances; 2-moderate; 3-severe), with severity levels described in detail for all items. Total scores range from 0 to 36, with higher scores indicating higher severity of delirium<sup>[30]</sup>.

### Delirium index

DI is an instrument for assessment of severity of symptoms of delirium<sup>[31]</sup>. It was adapted from the CAM, with the intention that it could be used in delirium research by a research assistant (non-psychiatrist). It includes 7 of the 10 symptoms domains of CAM<sup>[23]</sup> (disorders of attention, thought, consciousness, orientation, memory, perception, and psychomotor activity), each scored on a scale from 0 (absent) to 3 (present and severe) using operational criteria for each score. It is rated by observation of the individual patient, without additional information from family members, nursing staff or the patient medical chart. The other three domains of the CAM<sup>[23]</sup> (acute onset, sleep-wake disturbance, fluctuation) are excluded because they do not assess severity (acute onset) or cannot be assessed using patient observation only (fluctuation, sleep-wake disturbance). The total DI score varies from 0 to 21, higher score indicating greater severity. Intraclass correlation coefficient of interrater reliability for the scale is high (0.98). Cronbach  $\alpha$  for the DI is 0.74, indicating good internal consistency<sup>[31]</sup>. DI has good correlation with MMSE<sup>[63]</sup>.

### Confusional state evaluation scale

CSE is an observer-rated scale for assessing the severity of delirium which can be used by trained nurses, doctors and psychologists. It contains 22 items, 12 of which measure "key symptoms" of delirium which are considered to be diagnostic and also useful for assessment of severity of delirium. Scores on the 12 symptoms are regarded as core symptoms of the delirium syndrome are summarised to give a "confusion score". Another 7 items (irritability, emotional lability, wakefulness disturbance, increased psychomotor activity, reduced psychomotor activity, mental uneasiness and disturbance of the sleep-wake pattern) deal with symptoms occurring frequently in delirium and 3 items relate to the duration and intensity of the episode of delirium. All items are rated on 5 point. Inter-rater reliability is fair to excellent (weighted  $\kappa$  0.38-0.93). The correlation between the "confusion score" of the scale and the global rating by a psychogeriatrician has also been reported to be good ( $r = 0.79$ ). Severity scores have high correlation with other scales too<sup>[32]</sup>.

### Delirium assessment scale

It is based on DSM-III criteria and is used for assessment

of severity of delirium<sup>[33]</sup>. It has 8 items and has been shown to have good interrater reliability (0.66-0.99). Sensitivity and specificity were between 80% and 90%. However, it is not useful in distinguishing between delirium and dementia<sup>[33]</sup>.

### **Delirium severity scale**

The DSS was developed to measure delirium severity over time. It consists of combination of Forward Digit Span and similarities, with certain modifications. It can be completed by research assistants in about 10 min. It is sensitive to change of symptom severity with time and has significant correlation with improvement in expert ratings<sup>[34]</sup>.

## **INSTRUMENTS FOR ASSESSMENT OF COGNITIVE SYMPTOMS OF DELIRIUM**

Cognitive disturbances are part and parcel of delirium. Due to this, many of the instruments which have been primarily designed to assess disturbances in cognitive functions have been used for screening for delirium. Further, some of the earlier instruments which were used to assess the severity and phenomenology of delirium did not assess the cognitive functions comprehensively; these instruments were useful as supplements for assessment of cognitive functions in patients of delirium. These include MMSE<sup>[35]</sup>, CTD<sup>[36,37]</sup>, Clock Drawing Test<sup>[38]</sup>, Digit Span Test<sup>[39,40]</sup>, Vigilance "A" test<sup>[40]</sup>, Mental State Questionnaire (MSQ)<sup>[41,42]</sup> and Short Portable Mental Status Questionnaire<sup>[43]</sup>.

Delirium is more common in elderly, some of whom also suffer from dementia, hence it is also important to have an understanding of baseline cognitive functions of patients before considering the cognitive disturbances as part of the delirium. One of the instruments for such assessment is IQCODE<sup>[10,11]</sup>, which has been described earlier.

### **Mini mental state examination**

It is a 30 point instrument designed to assess cognitive impairment and covers 5 broad areas of cognitive functions: orientation (10 points), registration (3 points), attention and calculation (5 points), recall (3 points), and language (9 points)<sup>[35]</sup>. Over the years, studies have shown that scoring on MMSE is significantly affected by pre-morbid intelligence or education level. Higher level of education, foreign culture, and sensory impairment can lead to lower scores on MMSE. To overcome some of these limitations, culture and language specific adaptations (e.g., Hindi MMSE- HMSE)<sup>[64]</sup> have been designed.

### **Cognitive test for delirium**

CTD is designed to assess hospitalised delirium patients, particularly the ones intubated or unable to speak or write. A well-validated instrument, it is highly structured and very well anchored for rating and scoring. It reliably differentiates delirium from other neuropsychiatric

conditions like dementia, schizophrenia and depression. It covers 5 neuropsychological domains (orientation, attention, memory, comprehension and vigilance) and lays more emphasis on nonverbal (visual and auditory) modalities. Each domain is scored 0-6 with 2 point increments (except comprehension for which there are single point increments). Total score ranges 0-30, higher score indicates better cognitive functioning<sup>[36,37]</sup>.

### **Clock drawing test**

CDT has been used for screening the patients for delirium. It is easy to administer. In this test, the patient is given a pre-drawn circle (approximately 10 cm in diameter) and is instructed that "This is a clock face. Please fill in the numbers and then set the time to 10 past 11". The cognitive domains assessed by CDT include comprehension, planning, visual memory, visuospatial ability, motor programming and execution, abstraction, concentration, and response inhibition<sup>[38,65]</sup>. There are many scoring systems of varying degrees of complexity available in the literature most of which have been reported excellent psychometric properties of CDT<sup>[66]</sup>.

### **Digit span test**

It is a simple bed side test to evaluate the cognitive functions. In this a series of random numbers are presented at a rate of 1 per second and patient is asked to repeat the presented sequence. The first series involves presentation of 2-number sequence and if the patient answers the same correctly, then the next series is that of 3-number sequence and subsequently each correctly repeated series is followed by a sequence with 1 additional digit. A digit span of less than 5 is considered to be abnormal<sup>[40]</sup>.

### **Vigilance "A" test**

In this test a list of 60 letters of which 18 are the letter A is read to the patient at a rate of 1 letter per second. The patient is instructed to indicate to the examiner every time the letter A is heard. Only 2 errors are acceptable and more than 2 errors are considered abnormal<sup>[40]</sup>.

### **MSQ**

It is a brief, objective, and quantitative measurement of cognitive functioning of elderly people. It has 10 items which assess orientation in time and place, remote memory, and general knowledge. Numbers of errors are counted to assess the cognitive functions. All omissions are counted as errors. A score of 0-2 errors designates none or minimal dysfunction; 3-8 errors indicate moderate impairment in cognitive functions and 9-10 errors indicate severe impairment in cognitive functions<sup>[41]</sup>. It has been shown to have a sensitivity of 64% and specificity of 99% in detecting chronic brain syndrome<sup>[41,42]</sup>.

### **Short portable mental status questionnaire**

It is a 10 items instrument which can be easily administered by any clinician. Short portable mental status questionnaire (SPMSQ) was created as a variation of MSQ and

differs from MSQ in having an item for serial subtraction. Scoring is influenced by level of education and race had to be taken into account in scoring individual performance. If a patient makes 2 or less number of errors, it is considered to be normal. Three to 4 errors indicate mild cognitive impairment, 5-7 errors indicate moderate cognitive impairment and 8 or more numbers of errors indicate severe impairment of cognitive functions<sup>[43]</sup>.

## INSTRUMENTS FOR ASSESSMENT OF MOTOR SYMPTOMS OF DELIRIUM

Although the motoric disturbances associated with delirium are known since the earliest descriptions of the disorder, it was Lipowski<sup>[67]</sup> who first suggested “hyperactive” and “hypoactive” subtypes of delirium. Later, he added a third subtype “mixed” category in recognition that many patients experience elements of both within short time frames<sup>[68]</sup>. Soon after, some of the authors have added another subtype to the above three subtypes. Liptzin *et al*<sup>[69]</sup> described hyperactive, hypoactive, mixed and neither subtype of delirium. O’Keeffe *et al*<sup>[70]</sup> described hyperactive, hypoactive, mixed and no subtype of delirium. In view of the above described subtypes, studies have used the descriptions of agitation and retardation from the MDAS<sup>[22]</sup>, the DRS<sup>[29]</sup>, the DRS-R-98<sup>[21]</sup>, or visual analog scales, clinical observation, and agitation/sedation scale ratings to define motor subtypes. However, even now, there is inconsistency in the approach to assess the motoric subtypes. Some authors have also used RASS for motor subtyping. Recently electronic motor analysis has also been used for motor subtyping<sup>[71]</sup>.

Recently, Meagher *et al*<sup>[44]</sup> collated 30 clinical features used in different subtyping methods to define motor subtypes and developed a Delirium Motor Checklist (DMC). Next, they identified 11 items that by virtue of frequency, correlation with independent measures of motor behaviour and relative specificity for delirium were selected to comprise the Delirium Motor Subtype Scale (DMSS)<sup>[45]</sup>. The DMSS can be rated by both medical and non-medical staff and has been shown to have good concurrent and predictive validity<sup>[72,73]</sup>.

### Motor subtyping by Liptzin *et al*<sup>[69]</sup>

Specific symptoms on the DSI were defined as “hyperactive” or “hypoactive”. The hyperactive symptoms included hypervigilance, restlessness, fast or loud speech, irritability, combativeness, impatience, swearing, singing, laughing, uncooperativeness, euphoria, anger, wandering, easy startling, fast motor responses, distractibility, tangentiality, nightmares, and persistent thoughts. Hypoactive symptoms included unawareness, decreased alertness, sparse or slow speech, lethargy, slowed movements, staring, and apathy. Delirious patients who had three or more different symptoms of hyperactivity during any time of their hospital stay were rated as hyperactive subtype. Those who had four or more different symptoms of hypoactivity during any time of their hospital stay were

rated as hypoactive subtype. Those who were rated as positive on both were considered to have mixed subtype and those who were rated as negative on both were rated as having neither subtype.

### DMC and delirium motor symptom scale<sup>[44,45]</sup>

DMC is a checklist, which consists of 30 clinical features used in different subtyping methods to define motor subtypes. Of the 30 items, 11 items have been identified by virtue of frequency, correlation with independent measures of motor behaviour and relative specificity for delirium to comprise the DMSS which includes 11 items. Rating is done on the basis of definite evidence for each behaviour in the previous 24 h, which is a deviation from pre-delirious baseline. There must be presence of at least 2 out of 4 hyperactive items, or at least 1 out of 7 hypoactive items for the hyperactive and hypoactive subtypes to be diagnosed respectively. The subtype is considered to be “mixed” when there is concurrent evidence for both the above subtypes and “no motor subtype” when evidence for neither subtype is present.

## INSTRUMENTS FOR ASSESSMENT OF ETIOLOGY OF DELIRIUM

Delirium is considered to be multi-factorial in origin. Any medical-surgical condition can lead to delirium. Although studies have assessed the risk factors and etiologies associated with delirium, these have mostly been assessed depending on the medical-surgical setting or the factors considered being of significance by the researchers. In general, researchers have divided the risk factors for delirium into predisposing and precipitating factors. Predisposing factors are conceptualized as those that are present in the individual at the time of admission and reflect the underlying vulnerability to delirium. Precipitating factors are those noxious insults or hospital-related factors that contribute to the development of delirium. Studies have shown that the predisposing risk factors tend to have a relatively greater contribution to the development of delirium than for the precipitating factors<sup>[1]</sup>.

Recently, there have been some attempts to assess the etiology of delirium in a systematic way. Trzepacz *et al*<sup>[46]</sup> has developed a Delirium Etiology checklist to rate the association of various physical illnesses with delirium.

### Delirium etiology checklist

In this checklist the attribution is made based on all the available clinical information covering 12 etiological categories (drug intoxication, drug withdrawal, metabolic/endocrine disturbance, traumatic brain injury, seizures, intracranial infection, systemic infection, intracranial neoplasm, systemic neoplasm, cerebrovascular, organ insufficiency, other CNS disorder, and other systemic disorder). Presence and suspected role of each cause is rated on a 5-point scale based on degree of attribution to the delirium episode, ranging from “ruled out/not present/not relevant” (score-0) to “definite cause” (score-4)<sup>[46]</sup>.

## SCALES USED TO ASSESS DISTRESS DUE TO DELIRIUM EXPERIENCE IN PATIENTS

Studies suggest that a significant proportion of patients with delirium or confusional states recall their experience during the episode of delirium and report that these experiences as distressing and disturbing.

### **Delirium Experience Questionnaire**

Breitbart *et al.*<sup>[47]</sup> designed Delirium Experience Questionnaire (DEQ) to qualitatively and quantitatively assess the distress associated with delirium. It assesses the patient's experience of delirium after recovery. DEQ has 6 questions evaluating the experience of delirium in patients who have recovered from delirium<sup>[47]</sup>.

## CRITICAL APPRAISAL OF THE AVAILABLE INSTRUMENTS

It is evident from the review that development of instruments for assessment of delirium has moved far beyond just screening patients for delirium. Over the years, instruments have been designed not only to assess the severity and phenomenology of delirium and now the focus is on designing instruments specifically for motoric subtypes, distress associated with symptoms and etiological factors associated with delirium. Further, although not designed specifically for use in patients with delirium, many instruments which have been used to grade the severity of physical illnesses and prediction of mortality have been incorporated in delirium research to improve the understanding of this fluctuating disorder. Researchers have also realised the importance of having specific instruments for patients with younger age and ICU setting and such instruments have been designed for paediatric population and ICU setting.

It is evident that most of instruments have been designed based on the DSM criteria. In general, the instruments which are used for diagnosis (i.e., CAM, CAM-ICU, DRS-R-98, MDAS, *etc.*) have good to excellent reliability and fair to good validity. In view of the availability of the multiple instruments for diagnosis, it is important to understand which instruments would be most useful for diagnosis and screening of delirium. In a review of various diagnostic instruments for delirium which included studies based on Global Attentiveness rating, MDAS, CAM, DRS-R-98, CAC, DOSS, MMSE, Nu-DESC, Digit Span test and Vigilance "A" test for accurately diagnosing delirium at the bedside, the authors concluded that because of its accuracy, brevity, and ease of use by clinical and lay interviewers, the best supportive data is available for CAM as a diagnostic scale. Further, it was noted that of all the scales included for evaluation in the review, MMSE (score < 24) was the least useful for identifying a patient with delirium. It was also seen that when used in isolation, Digit Span test and Vigilance "A" test had

limited usefulness for diagnosing delirium<sup>[74]</sup>. However, it is to be remembered that studies have shown that validity of CAM is low when it is used by nurses and untrained physicians<sup>[56,75]</sup>.

With regard to screening patients in the ICU, a study compared the usefulness of CAM-ICU, Nu-DESC and delirium detection score (DDS) against the reference standard conducted by a delirium expert (blinded to the study), who used DSM-IV criteria of delirium. It was seen that CAM-ICU and the Nu-DESC had comparable sensitivities, but the specificity of CAM-ICU was significantly higher than that of Nu-DESC. In contrast, the DDS had sensitivity (30%), but specificity was significantly higher than the Nu-DESC. The interrater reliability was best for CAM-ICU<sup>[75]</sup>.

With regard to screening patients in general medical and surgical wards, NEECHAM and DOS appear to be most suitable as a screening instrument, depending on the type of rater (physician or nurse). NEECHAM has the benefit of rating the patients once only, whereas DOS Scale requires administration over 3 consecutive shifts.

DRS-R-98 appears to be a comprehensive instrument useful for diagnosis of delirium. Further, it is useful in rating the severity of delirium and is sensitive to change and hence can be used for monitoring patients of delirium over a period.

Although studies have evaluated the sensitivity, specificity and interrater reliability of various instruments, the methodology used for testing these have varied significantly. Another important aspect to note is that most of the instruments have been validated in elderly population. Hence, there is need to validate these instruments in other age groups too. Further, research has not focused on the ease of use of these instruments in various treatments setting by different level of health professionals. Our review of literature also suggests that many of instruments have not been evaluated further after the initial use and have not been used in research.

In the future, there is a need to revise some of these instruments to increase their usefulness in routine clinical practice and in the research setting. There is limited research in the other aspects of delirium like phenomenology, subtypes, associated etiologies, risk factors, outcome, distress to the patients in the recovery phase, distress of the caregivers and these should be assessed systematically using validated rating scales for each aspect.

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